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Neocrangon zacae (Chace, 1937) synonymized with *N. resima* (Rathbun, 1902), and compared with *N. communis* (Rathbun, 1899) (Decapoda: Caridea: Crangonidae)

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Abstract.—Features previously used to distinguish between *Neocrangon zacae* and *N. resima* overlap greatly. The rostrum can be low and narrow, slightly elevated and deep, or high with a plate with or without teeth. The width of the hand of the first pereopod also varies, as does the distal width of the antennal scale. Similar variability exists in the shape of the rostrum of *N. communis,* but this species has a prominent carina on the fifth abdominal somite and has broader hands of the first pereopod and a more horizontal dactyl. Usually, adult *N. resima* are smaller than *N. communis. Neocrangon zacae* is considered to be a junior synonym of *N. resima.* A redescription of *Neocrangon resima* is presented.

Crangonid shrimp of the genus *Neocrangon* Zarenkov, 1965, are characterized as follows: two median carapace spines, without submedian spines between the middorsal line and hepatic spine, the branchiostegal spine not very strong or flared sideways, the gastric region not depressed below the general level of the carapace, one or two spines at the distal end of the merus of first pereopod, second pereopods subchelate and subequal in length to other pereopods, fourth and fifth pereopods with normal dactyls; not broadened; lateral surface of the abdomen not sculptured. Four species have been reported from the northeastern Pacific: *N. communis* (Rathbun, 1899), *N. resima* (Rathbun, 1902), *N. abyssorum* (Rathbun, 1902) and *N. zacae* (Chace, 1937). Of these, *N. abyssorum* is the most distinct, having enlarged eyes, a bent antennular peduncle, a long and narrow rostrum and a thin exoskeleton. It generally occurs on the lower continental slope, but has been reported as shallow as 97 m (Butler 1980).

Colleagues conducting environmental impact surveys had difficulty distinguishing between *N. communis, N. resima* and *N. zacae. Neocrangon resima* has been recognized by its elevated rostrum with a ventral plate (Rathbun 1904:fig. 65). However, Rathbun noted that the development of the rostrum seemed to be dependent on age, with specimens smaller than 20 mm not showing this feature. Schmitt (1921) quoted Rathbun as stating that the rostrum of *N. communis* also could be variable, with some specimens regenerating a narrow rostrum with an elevated tip. The illustration of the rostrum given by Schmitt (1921:fig. 64) shows a bilobed rostrum with a small tooth, while that by Green & Butler (1988) shows a rostrum ending in a vertical plate. The rostrum of *N. zacae* was described as ascending at a slight angle "which varies somewhat" (Chace 1937).

The hands of the first pereopod of *N. resima* were reported by Schmitt (1921) to be shorter and with a more longitudinal margin than in *N. communis.* The hands of the first pereopod of *N. zacae* were said by Chace (1937) to have a "longer palm" than those of *N. resima,* as well as a more longitudinal

dactyl. However, Green & Butler (1988) did not indicate any difference between the proportions of the palm of their specimen of *N. resima* and that of any other species.

Schmitt quoted Rathbun as saying that *N. resima* had a "slight" median carina on the fifth abdominal somite while *N. communis* had a "blunt" carina. Green & Butler (1988) illustrated a specimen of *N. resima* with a "moderate" median dorsal carina, but noted that the carapace and abdominal sulci bore a short pubescence, as Butler (1980) reported for *N. communis*. *Neocrangon zacae* lacked a carina on the fifth abdominal somite (Chace 1937).

The ranges and habitats of the three species have been reported to overlap in the eastern Pacific. According to Butler (1980), *N. communis* ranges from the Bering Sea to San Diego, California at 16–1537 m on mud. Green & Butler (1988) reported *N. resima* from mud or mixed mud and sand bottoms from Alice Arm, British Columbia to San Domingo Point, Baja California; Schmitt (1921) reported the depth range as 28–487 m. *Neocrangon zacae* has been reported from Monterey Bay, California to north of Gorgona Island, Colombia (although most reports come from California, U.S.A. and Baja California, Mexico) at depths from shore to 572 m. It has been reported from muddy or rocky bottoms. In southern California and Baja California, *N. zacae* usually was collected at shallower depths than *N. communis* (Wicksten 1980). *Neocrangon communis* and *N. resima* have been reported to be collected at the same trawling station (Schmitt 1921; Green & Butler 1988).

Considering the overlap in range, depth and morphological features reported for *N. communis, N. zacae* and *N. resima*. I examined specimens to determine what consistent differences could be found between them. Comparison of these specimens indicate that only two of these species are distinct.

Materials and Methods

I examined 179 specimens identified as *N. communis, N. resima* or *N. zacae* from Santa Monica Bay and Monterey Bay, California and Cook Inlet and the northeastern Gulf of Alaska. One hundred fifty two specimens from Santa Monica Bay were loaned by Ann Dalkey of the Hyperion Treatment Plant, Los Angeles County Environmental Monitoring Division; the specimens from Monterey Bay and Alaska were loaned by the California Academy of Sciences (CAS 014038, 020155, 020163 and 020155). I also examined the six syntypes of *N. resima,* collected off San Diego, California, from the National Museum of Natural History, Smithsonian Institution (USNM 25246).

For each specimen, I noted total length, shape (low, deep, with plate, with or without teeth) and elevation of the rostrum, presence or absence of a noticeable dorsal carina of the fifth abdominal somite, and shape of the hand of the first pereopod. These data were tabulated and compared with the original descriptions of the species.

Results

The most striking difference among the shrimp examined was that all specimens from the Gulf of Alaska and Cook Inlet had a pronounced and blunt dorsal carina on the dorsal surface of the fifth abdominal somite (Fig. 1f). None of those from California had more than a vague trace of a dorsal carina (Fig. 1c). The Alaskan specimens were larger, ranging from 37.1–61.1 mm in total length. The specimens from California ranged from 19.5–50.6 mm in total length, but most individuals (59) were between 35–40 mm long.

The shape of the rostrum was low and narrow in 87 specimens from California and 13 Alaskan specimens, elevated but without a plate in 52 specimens from California and eight from Alaska, and elevated and with a plate in 14 specimens from Santa Monica Bay, three from Monterey

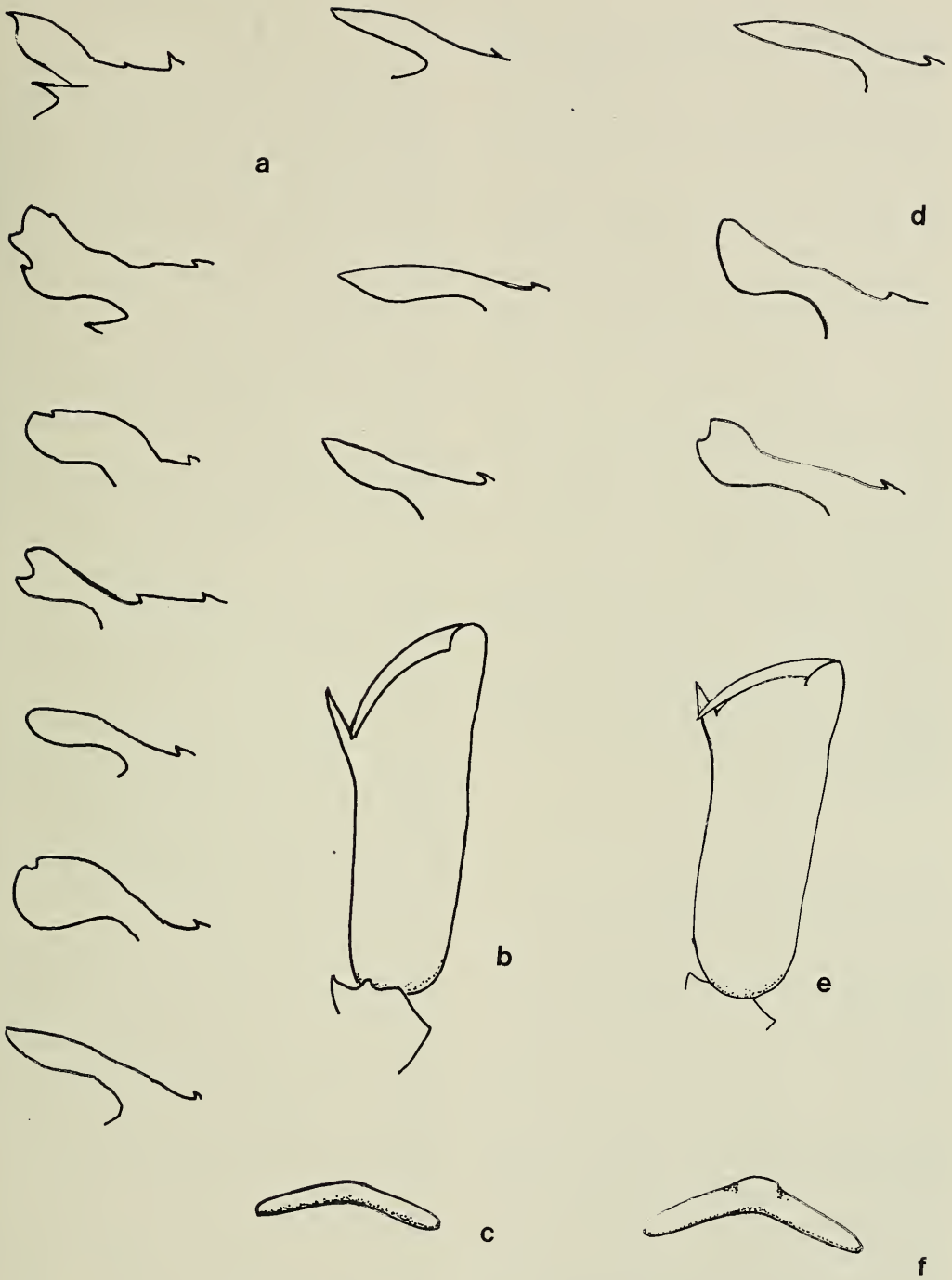

Fig. 1. *Neocrangon resima* (Rathbun, 1902). a, 10 shapes of the rostrum; b, subchela of first pereopod; c, dorsal surface of fifth abdominal somite in frontal view. *Neocrangon communis.* d, three shapes of the rostrum; e, subchela of first pereopod; f, dorsal surface of fifth abdominal somite in frontal view.

Bay and one from Alaska. In other specimens, the rostrum was broken off. In the collection from Santa Monica Bay, specimens with an elevated rostrum with a plate comprised about 9% of the total collection.

Some of the shapes of the rostrum are shown in Fig. 1a and 1d. It was difficult to determine the difference between "elevated and deep" and "elevated with a plate"; moreover, the number of teeth (if any) also varied. Most of the rostra did not have teeth except for a pointed apex. Among the syntypes of *N. resima,* the shape of the rostrum varied: two had a very low rostrum, one had a short but upraised rostrum and three had a moderately upraised rostrum. It is noteworthy that none of the syntypes had a raised rostrum with a plate, as illustrated by Rathbun (1904:fig. 65b).

Most of the specimens from Alaska had a broader hand and also a more horizontal dactyl of the first pereopod than those from California (Fig. 1e). In general, the specimens from California had a more elongated hand with a more vertical dactyl (Fig. 1b), similar to that illustrated by Chace (1937: fig. 9d) for *N. zacae.*

Discussion

In comparing the syntypes of *N. resima,* the other specimens and the descriptions, the presence or absence of a carina on the dorsal surface of the fifth abdominal somite was the most reliable distinguishing feature for recognition of species. Such a carina is present in *N. communis. Neocrangon communis* also may have a broader hand of the first pereopod, about 2.7–3× long as wide, although some specimens may have a hand as much as 3.7× long as wide (Butler 1980). The hand has a dactyl that closes somewhat horizontally. The specimens from Alaska could be confidently identified as *N. communis.* The specimen illustrated by Green & Butler (1988) as *N. resima* probably also belongs to *N. communis.* Except for the variation in the shape of the rostrum, the specimens fit well the description of *N. communis* given by Butler (1980, as *Crangon communis*).

The shape of the rostrum is unreliable as a diagnostic character of species of *Neocrangon.* Among the specimens from Monterey Bay and Santa Monica Bay, it varied from low to high, shallow to deep, and with or without a plate, which sometimes had teeth. Variation also occurred among the syntypes of *N. resima* and the specimens of *N. communis.*

Rathbun (1904) stated that the development of the rostral plate was dependent on age, "specimens 20 mm long show no evidence of it." However, in two specimens with a total length of 22–28 mm, there was an elevated rostrum; another had a rostrum with a well-developed plate. Because my samples contained only one specimen less than 20 mm long, it is difficult to say whether or not the development is related to age or size. The smallest specimen, 19.5 mm long, had a low rostrum without a plate.

The features of the fifth abdominal somite and first pereopod are indistinguishable between *N. resima* and *N. zacae.* The ranges as reported for the two species, their habitat and depth also overlap. In the absence of any other distinguishing features, *Neocrangon zacae* (Chace, 1937) must be considered to be a junior synonym of *N. resima* (Rathbun, 1902). It is unfortunate that the species was illustrated in Rathbun's work from an atypical specimen having a raised rostrum and a ventral plate, for this shape of the rostrum occurs in less than 10% of the population. A redescription of *N. resima,* including new information on variability within the species, follows.

Neocrangon resima (Rathbun, 1902)

Crangon resima Rathbun, 1902: 889.—Rathbun 1904:124, fig. 65.
Crago resima.—Schmitt 1921:96, fig. 64.
Crago zacae Chace, 1937:136, text-fig. 9.
Neocrangon zacae.—Kuris & Carlton 1977:554.—Wicksten 1980:39.

Neocrangon resima.—Kuris & Carlton 1977:554.

Redescription. (Modified from Chace 1937).—Rostrum usually narrow, with pronounced dorsal sulcus and blunt apex, variable in length, not reaching end of cornea of eye to exceeding entire eye. Rostrum ascending, usually at slight angle but as much as 45° in some specimens; ventral plate, with or without teeth, may be present.

Carapace about 0.25× length of abdomen. Gastric region not depressed below general outline of carapace. Two spines in dorsal midline, posterior one longer and arising in front of middle of carapace. Strong hepatic spine in line with anterior dorsal spine. Anterior margin with antennal and branchiostegal spines.

Eye large and black.

Abdominal somites with few small setae along ventral surface but without obvious pubescence. Somites 1 and 2 with elevated posterior portions, elevations preceded by broad, shallow transverse sulci. Somites 1–4 without carinae. Pleura of first to third somites with rounded or squared margins, fourth pleuron with minute posteroventral spine, fifth pleuron with posterolateral point. Fifth somite occasionally with obscure median carina. Sixth somite approximately 1.6× length of fifth, bearing pair dorsal longitudinal carinae separated by median sulcus and bounded by shallower lateral sulci. Telson longer than sixth somite, with slight median sulcus, bearing 2 pairs dorso-lateral spines, apex blunt.

Antennular peduncle with 3 segments, second 2–3× length of third, stylocerite short. Antennular flagella exceeding antennal scale. Basicerite of antenna with lateral spine. Spine of antennal scale exceeding blade, antennal scale about 3.5× long as wide.

Third maxilliped long and slender, extending slightly beyond antennular flagella, exopod with lash. First pereopod subchelate, merus with spine at outer angle of distal end, palm of subchela 3–3.3× long as wide, dactyl closing obliquely. Second pereopods slender, shorter than first, chelate. Third pereopods slender, extending well beyond third maxillipeds, fourth and fifth pereopods shorter; all with simple, slender dactyls. Uropods equal to or exceeding length of telson.

Color in life translucent, mottled finely with greenish-brown and scarlet on dorsal and lateral surfaces; ventral surface white, antennae banded with scarlet and white, uropods and telson mottled.

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